Wu Zetian, the only female emperor in Chinese history, had two pandas, Sing and Ping. These greatly cherished pets had to be treated equally, while still granting the placid animals their own idiosyncrasies. Sing, for example, found total zen in square environments, while Ping harmonized with circular ones. The queen wanted sleeping pens for her beloved bears, one in a perfect circle, the other a perfect square.

She had just been given a gift of 100 meters of gold thread webbing all in one piece, beautiful material she wanted to use as fencing for the pens, wrapped around fencing poles. Naturally, Sing and Ping must have equal sleeping areas, and not a shred of the gold webbing must be wasted!

Where should the webbing be cut so that each piece will enclose a sleeping pen of equal area for Ping and Sing?   The carpenters can only cut once, so their lives depend on your answer!

PART I:

You need three equations:

1. Area of square in terms of piece of webbing P.
2. Area of circle in terms of piece of webbing C.
3. P + C = _____

You will be solving the equation, but more than that, I want you to think about what the answer means, and what else it reveals about circles and squares.

Your gold webbing will help you think through the problems involved. You should have a chain of 100, with colored clips marking each 20.

Gold webbing! Kind of.

System Variables:

P: The part of the webbing used to make the square

C: The part of the webbing used to make the circle

You can work this problem any way you like, but at the end of this section you will have identified the following:

1. P + C = _____

2. What is the area of the square, in terms of P?

   _____

3. What is the area of the circle, in terms of C?

   _____

Suggestions:

Break the chain up into two pieces. I suggest pieces that are multiples of 4. (WHY? Important thing to consider).

Form the pens. What's the area? How did you find it? What about the circle?

Part II

Now that you have the three equations, you can create a system that will answer the question. Suggestion: Use the linear equation to create a substitution term for one of the quadratics.

Put your work here:

Answer: P=_____   C= _____   Area=_____

Part III--Challenge

Given an arbitrary point P on a line segment AB, let AP form the perimeter of a square and PB form the circumference of a circle.

Find AP as a percentage of AB such that the area of the square and circle are equal.

Sound familiar? Use your work in the previous section.